

WHAT IS CLAIMED IS:

1. An illumination device, which is used in a document-reading device configured to irradiate light over at least a predetermined illumination width including a reading area having a predetermined reading width extending in a main scanning direction of a document and to read the light reflected from the document using an image-reading element, the illumination device comprising:

a point light source; and

a light-guiding member having an incident surface opposed to a light-emitting surface of the point light source and a light-emitting surface opposed to the reading area; wherein

an illumination area generated by the light irradiated from the point light source has a high illuminance distribution range of a substantially constant illuminance, and the high illuminance distribution range coincides substantially with the reading area.

2. The illumination device according to claim 1, comprising a plurality of the point light source that are arranged in the main scanning direction.

3. The illumination device according to claim 1, further comprising a reflector configured to surround a region over which the light emitted from the point light source is irradiated between the point light source and the incident surface of the light-guiding member.

4. The illumination device according to claims 1, wherein an illuminance distribution of the illumination area has a full width at half maximum of not more than three times the predetermined illumination width.

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5. The illumination device according to claim 1, further comprising a light-shielding member configured to shield a surface of the document located above the light-guiding member from the light emitted from the light-emitting surface of the light-guiding member.

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6. The illumination device according to claim 1, further comprising an opposing reflector located at a position opposed to the light-emitting surface of the light-guiding member and beyond the reading area.

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7. The illumination device according to claim 1, wherein the light-guiding member comprises a cylindrical lens.

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8. The illumination device according to claim 7, wherein a position of a focal line opposed to the incident surface of the cylindrical lens coincides substantially with a center portion in a sub-scanning direction of the point light source.

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9. The illumination device according to claim 7, wherein the cylindrical lens is located at a position relative to a cross section taken along in the sub-scanning direction such that the point light source and

a center of the reading area are in a conjugate relationship having a predetermined image forming magnification.

10. The illumination device according to claim 1, wherein a surface  
5 except for the light-emitting and incident surfaces of the light-guiding member is configured to reflect light..

11. The illumination device according to claim 1, further comprising  
a plurality of the point light source that are arranged in the  
10 sub-scanning direction.

12. The illumination device according to claim 1, wherein the point light source is a light-emitting diode.

15 13. The illumination device according to claim 1, wherein the predetermined reading width corresponds to a width in the sub-scanning direction over which the image reading element receives the light.

20 14. The illumination device according to claim 1, wherein the predetermined illumination width is equivalent to a width corresponding to a variation due to a manufacture tolerance of parts of the illumination device added to a width corresponding to a width in the sub-scanning direction over which the image reading element receives the light.

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15. The illumination device according to claim 1, wherein the image-reading element is a charge-coupled device..

16. The illumination device according to claim 1, wherein the  
5 image-reading element is a photodiode array.

17. A document reading device configured to irradiate light over at least a predetermined illumination width including a reading area having a predetermined reading width extending in a main scanning direction  
10 of a document and to read the light reflected from the document using an image-reading element, the document reading device comprising an illumination device including:

a point light source; and

a light-guiding member having an incident surface opposed to a  
15 light-emitting surface of the point light source and a light-emitting surface opposed to the reading area; wherein

an illumination area generated by the light irradiated from the point light source has a high illuminance distribution range of a substantially constant illuminance, and the high illuminance distribution  
20 range coincides substantially with the reading area.

18. The document reading device according to claim 17, wherein the illumination device is compatibly used for both a fixed document reading scheme and a document transfer reading scheme.

19. The document reading device according to claim 17, wherein the document reading device is of a monochrome document reading device and the substantially constant illuminance has a flatness of not more than 30 %.

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20. The document reading device according to claim 17, wherein the document reading device is of a color document reading device and the substantially constant illuminance has a flatness of not more than 12 %.

10 21. An image forming apparatus comprising a document reading device configured to irradiate light over at least a predetermined illumination width including a reading area having a predetermined reading width extending in a main scanning direction of a document and to read the light reflected from the document using an image-reading  
15 element, the document reading device comprising an illumination device including:

a point light source; and

a light-guiding member having an incident surface opposed to a light-emitting surface of the point light source and a light-emitting

20 surface opposed to the reading area; wherein

an illumination area generated by the light irradiated from the point light source has a high illuminance distribution range of a substantially constant illuminance, and the high illuminance distribution range coincides substantially with the reading area.

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22. The illumination device according to claim 1, wherein  
the light-guiding member includes a pair of a convex cylindrical  
lens having the incident surface and a concave cylindrical lens having  
the light-emitting surface,

5 a center of the point light source in a sub-scanning direction is  
located on a composite focal line of the light-guiding member, and  
a region over which the light emitted from the point light source  
is irradiated between the point light source and the incident surface of  
the light-guiding member is surrounded by a reflector.

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23. The illumination device according to claim 1, wherein  
a region over which the light emitted from the point light source  
is irradiated between the point light source and the incident surface of  
15 the light-guiding member is surrounded by a reflector having a parabolic  
cross section taken along a sub-scanning direction, and  
the reflector has a focal point at the point light source.

24. The illumination device according to claim 23, wherein at least a  
20 part of the light that has reached the reflector is emitted toward the  
document from between the light-guiding member and the reflector.

25. The illumination device according to claim 23, wherein  
the light-guiding member comprises a cylindrical lens,  
25 a position of a focal line opposed to the incident surface of the

cylindrical lens coincides substantially with a center portion in a sub-scanning direction of the point light source,

the cylindrical lens is of a compound lens having a convex cylindrical lens unit with a convex surface facing the point light source  
5 and a plane portion,

a symmetry axis of the reflector is configured to coincide with an optical axis of the cylindrical lens, and

light that has reached the reflector is directed toward the document via the plane portion of the cylindrical lens.

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26. An adjusting device configured to adjust an illumination device which is used in a document-reading device configured to irradiate light over at least a predetermined illumination width including a reading area having a predetermined reading width extending in a main  
15 scanning direction of a document and to read the light reflected from the document using an image-reading element, the illumination device including:

a point light source;

a light-guiding member having an incident surface opposed to a  
20 light-emitting surface of the point light source and a light-emitting surface opposed to the reading area;

a first carriage configured to shift an illumination area in a sub-scanning direction; and

a support base configured to support and hold the point light  
25 source and the light-guiding member together as a unit, and to be

attached to the first carriage adjustably in the sub-scanning direction,  
wherein

the illumination area generated by the light irradiated from the  
point light source has a high illuminance distribution range of a  
5 substantially constant illuminance, and the high illuminance distribution  
range coincides substantially with the reading area.

27. A document reading device comprising an adjusting device  
configured to adjust an illumination device which is used in a  
10 document-reading device configured to irradiate light over at least a  
predetermined illumination width including a reading area having a  
predetermined reading width extending in a main scanning direction of  
a document and to read the light reflected from the document using an  
image-reading element, the illumination device including:

15 a point light source;

a light-guiding member having an incident surface opposed to a  
light-emitting surface of the point light source and a light-emitting  
surface opposed to the reading area;

a first carriage configured to shift an illumination area in a  
20 sub-scanning direction; and

a support base configured to support and hold the point light  
source and the light-guiding member together as a unit, and to be  
attached to the first carriage adjustably in the sub-scanning direction,  
wherein

25 the illumination area generated by the light irradiated from the



point light source has a high illuminance distribution range of a substantially constant illuminance, and the high illuminance distribution range coincides substantially with the reading area.

- 5 28. The illumination device according to claims 1, wherein an illuminance distribution of the illumination area has a full width at half maximum of not more than two times the predetermined illumination width.